Innovations in Effective Harvest Management

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What Quality Reaches the Cow's Mouth

- When you harvest
- How long it takes from start to finish
- The quality lost in harvest/fermentation

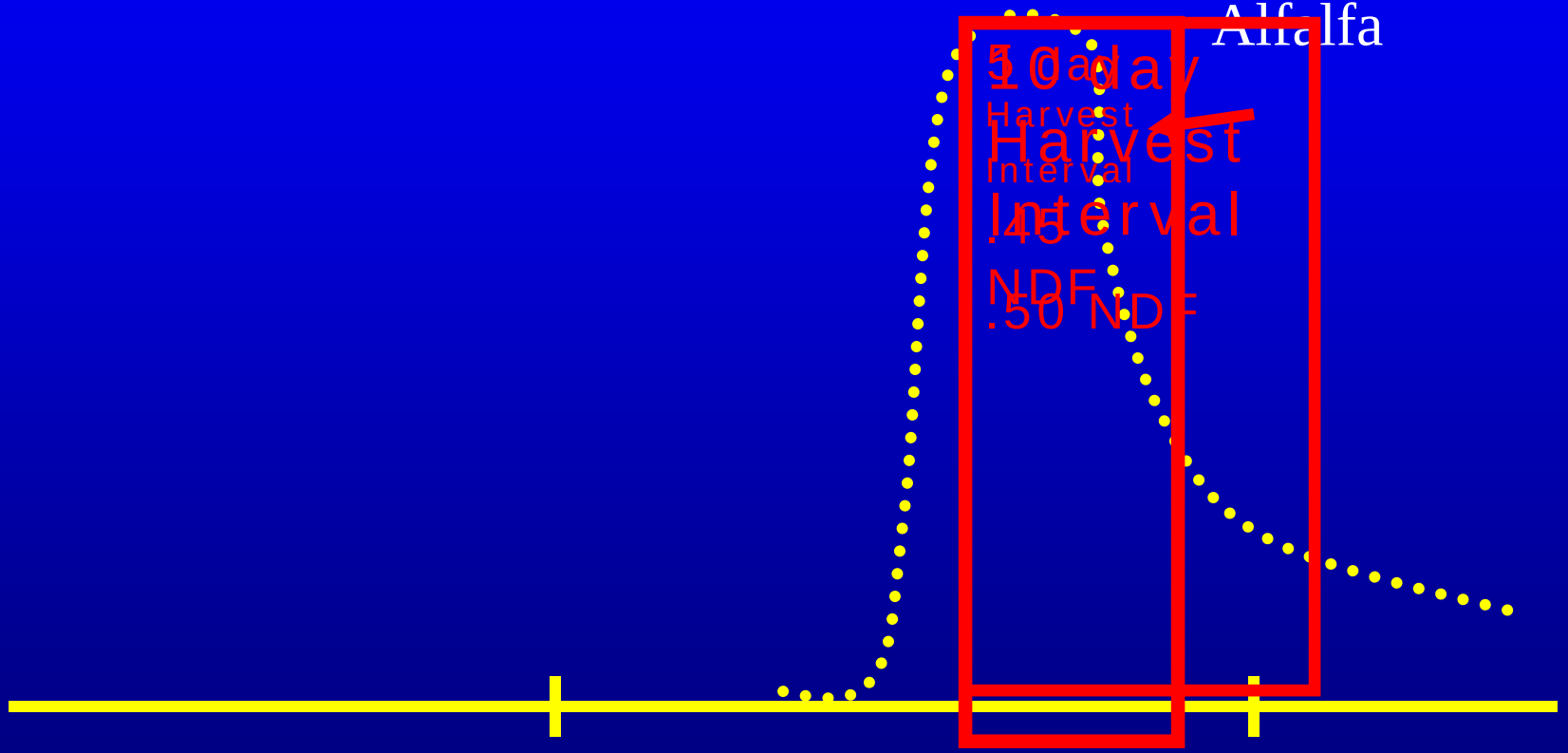
When You Start Harvest: Quality Window Opens

- When Alfalfa is 15 – 16 inches
- Cut Grass

- When Alfalfa is 23 – 24 inches
- Cut Alfalfa-Grass Mix

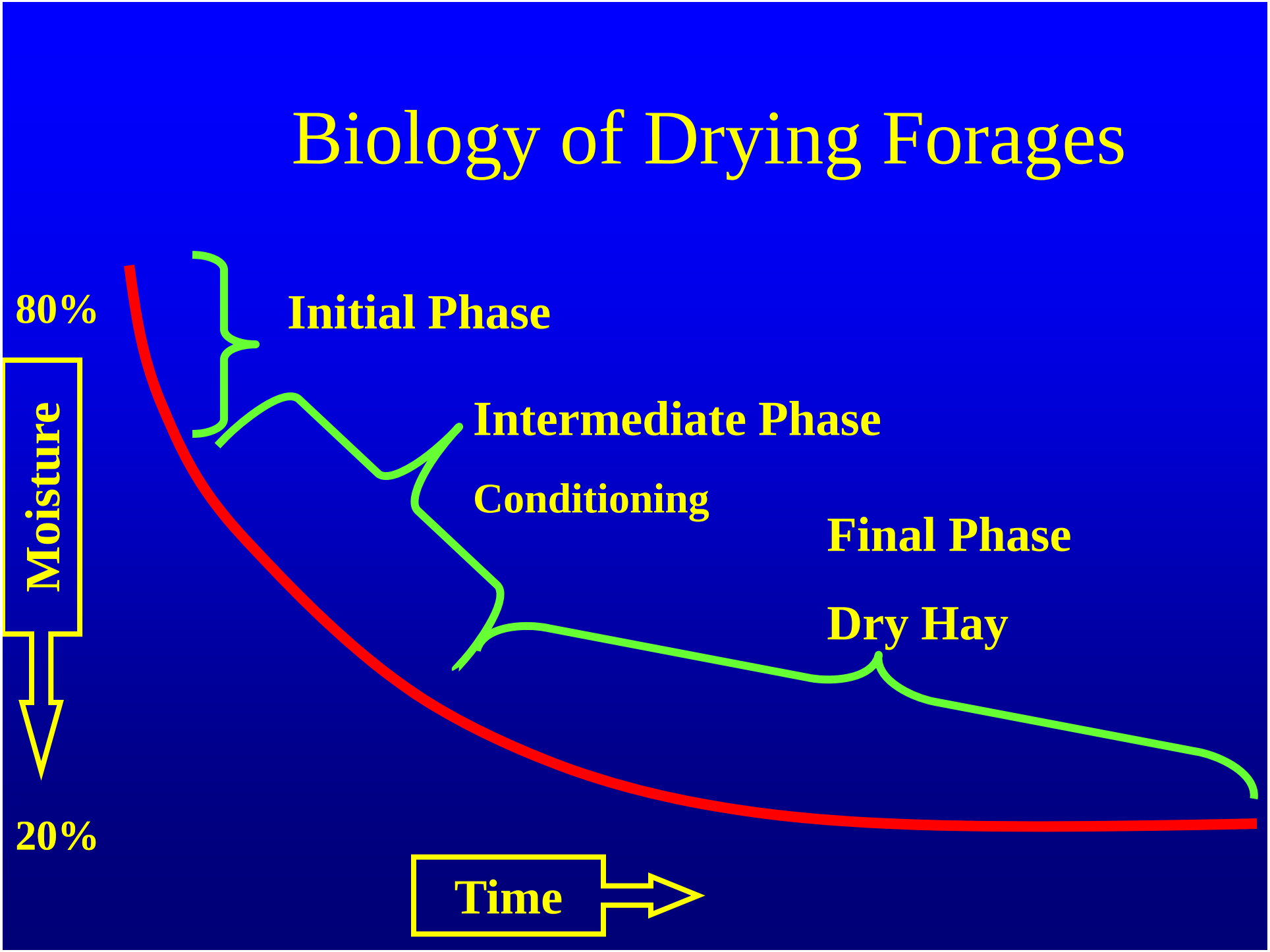
- When Alfalfa is 30 inches
- Cut Alfalfa

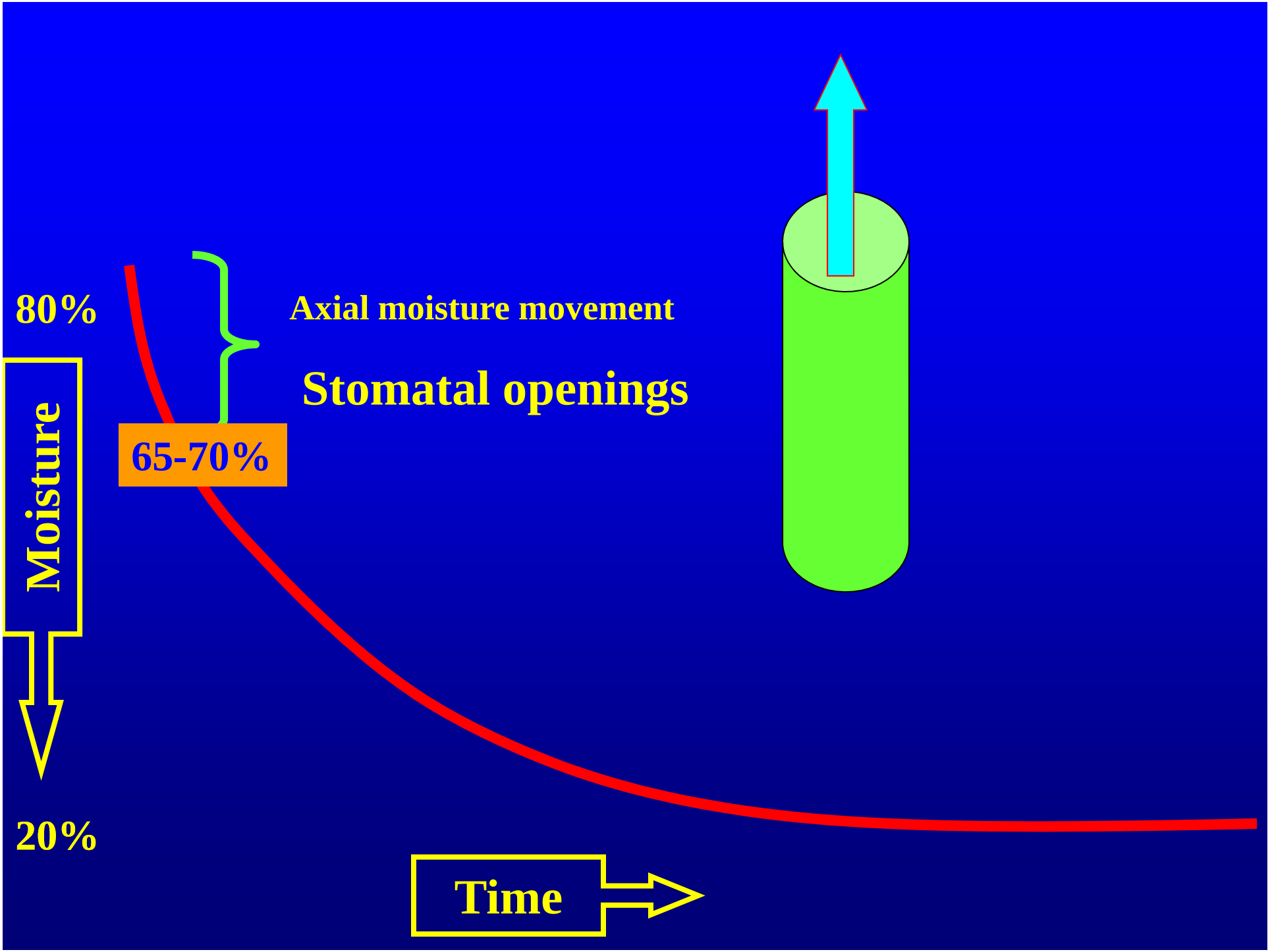
How Long Does it Take to Harvest?



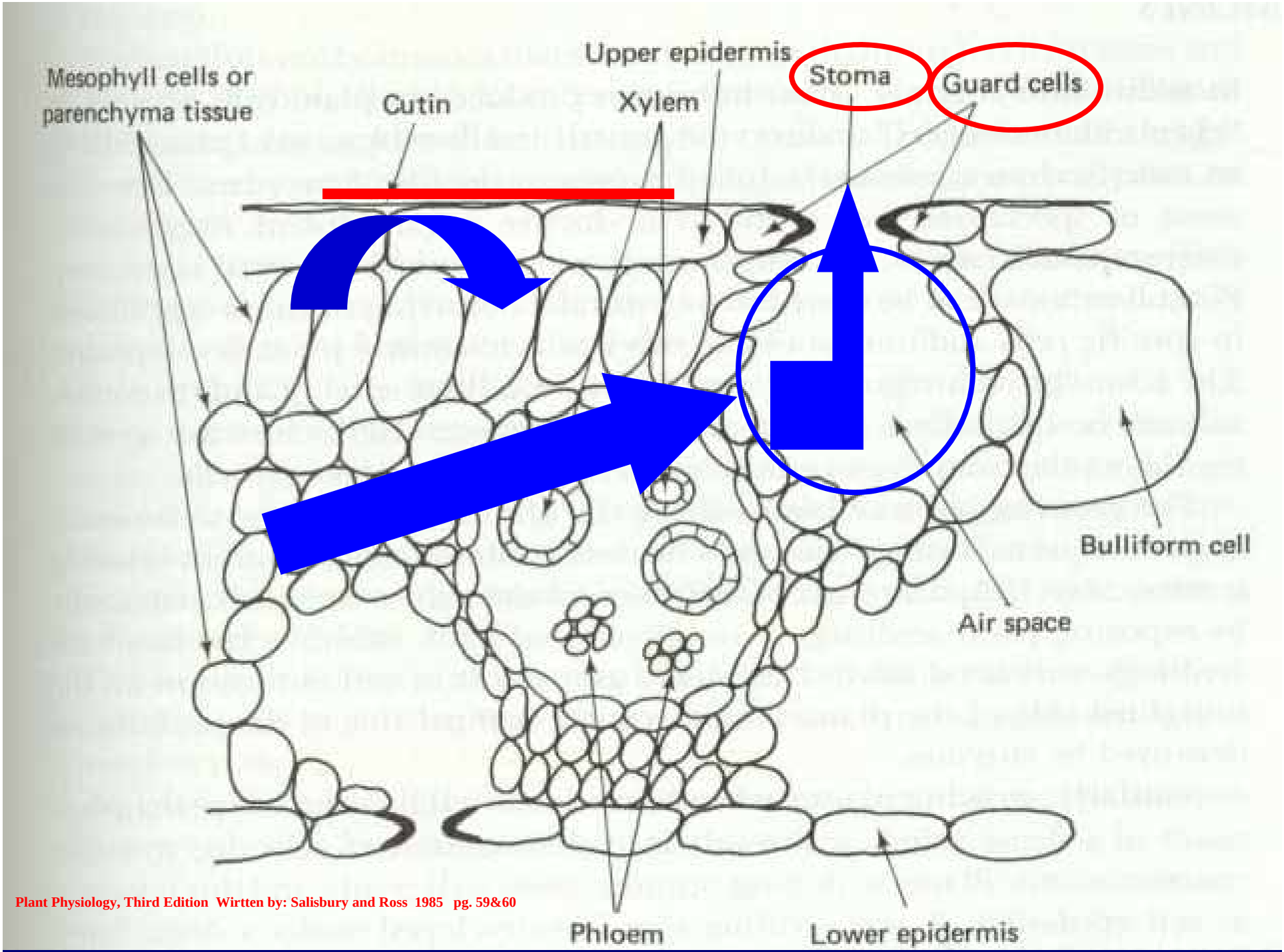
100 Cows, Cumulative Loss Each Day Harvest is Delayed

Biology of Drying Forages



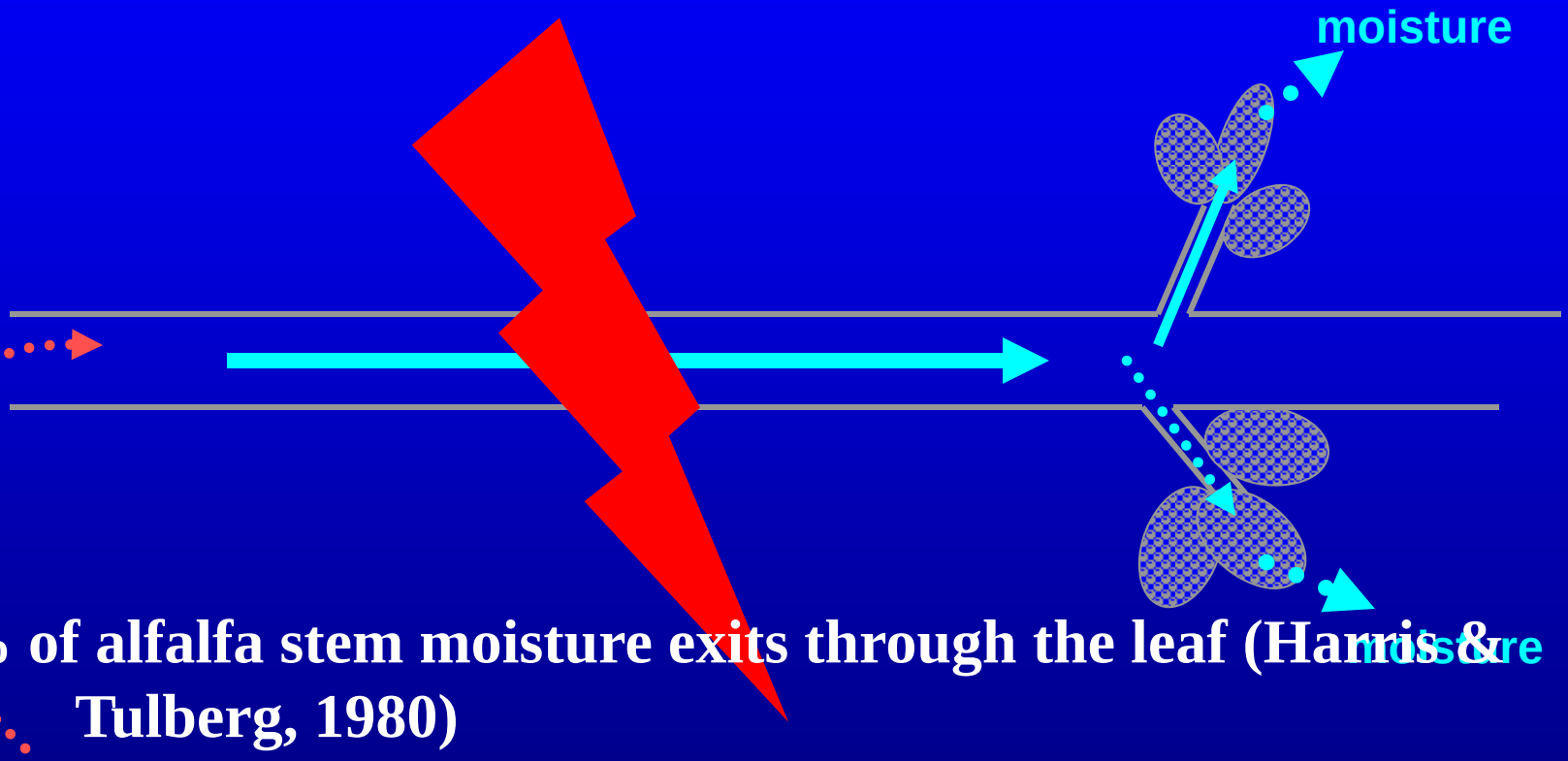

80%
Axial moisture movement
Stomatal openings
65-70%
Moisture
20%
Time


Stomate = Lungs of the Plant



Plant Physiology, Third Edition Wirtten by: Salisbury and Ross 1985 pg. 59&60

Conditioning Breaks Capillary Flow

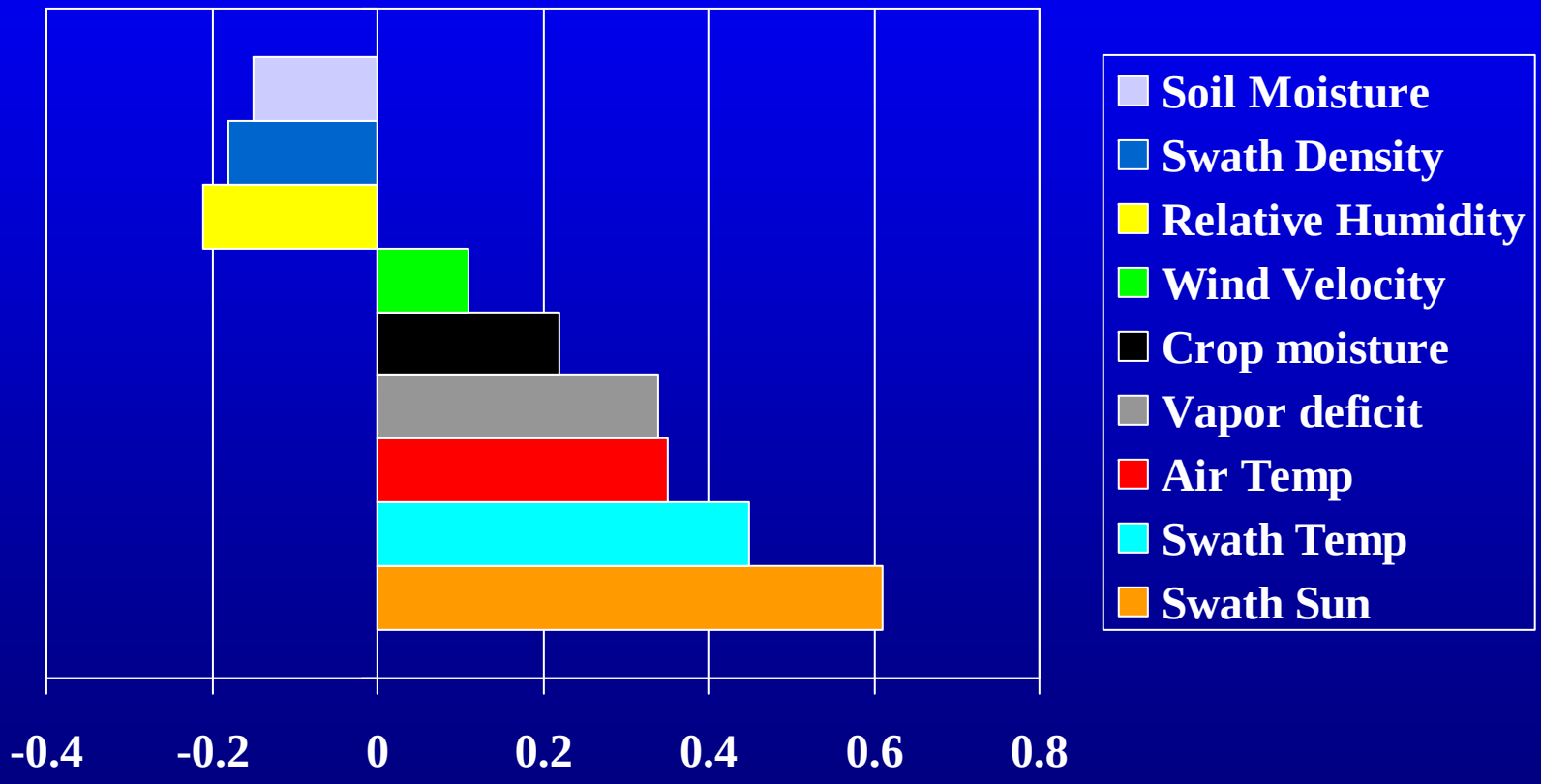


35% of alfalfa stem moisture exits through the leaf (Harris & Tulberg, 1980)

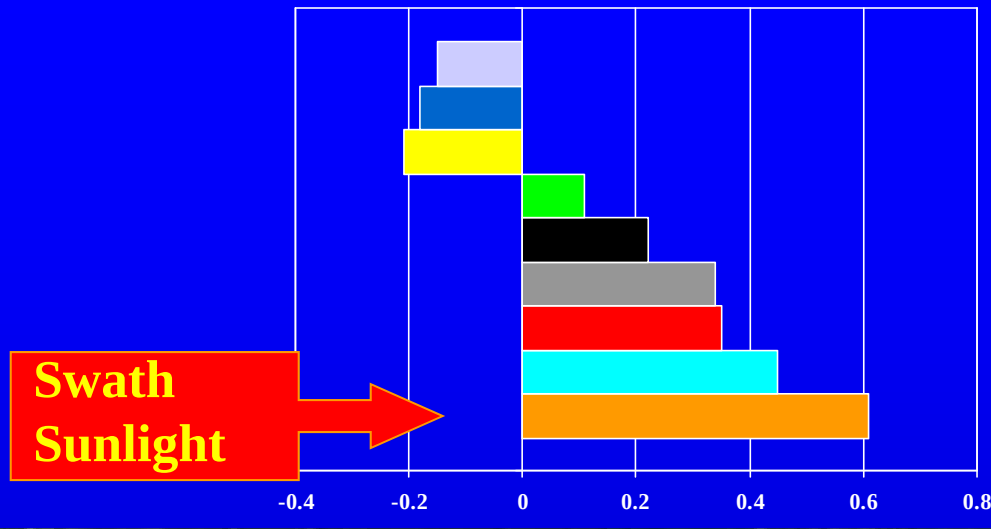
Legumes 10X more stomata than Grass

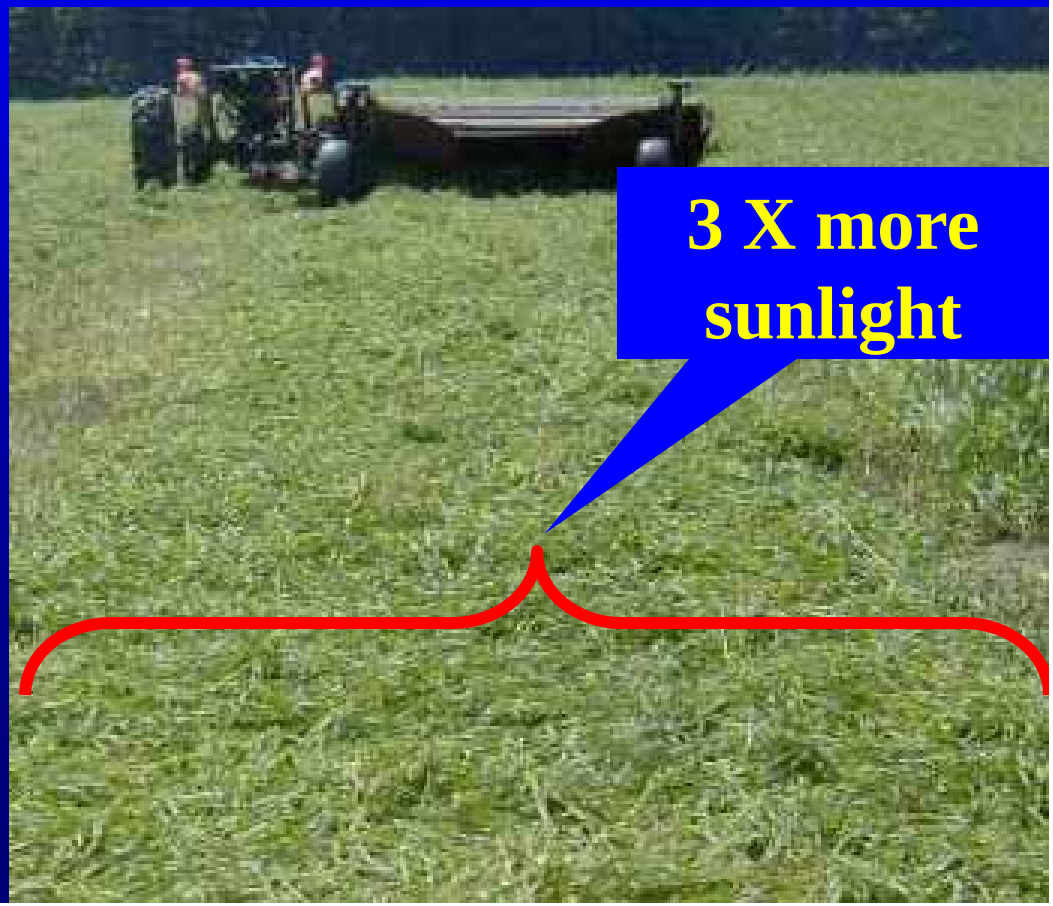
Sunlight – they stay open -shading closes Stomata

Physics of Moisture Loss
or
What Helps or Hurts Drying



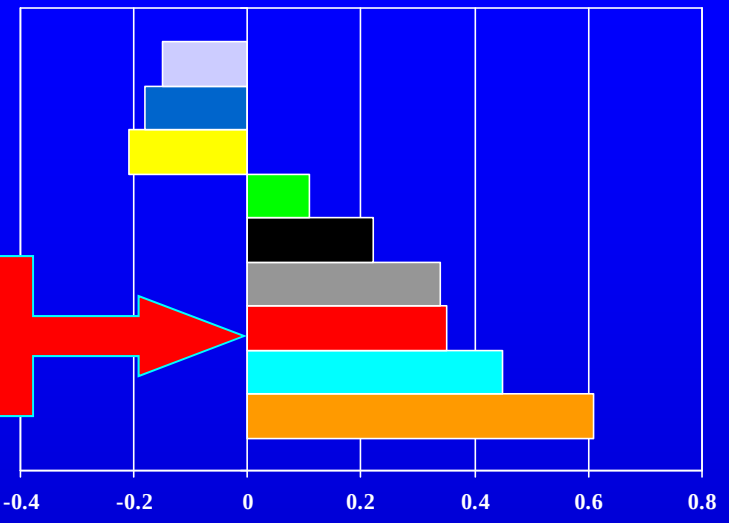
Rotz et.al 1987

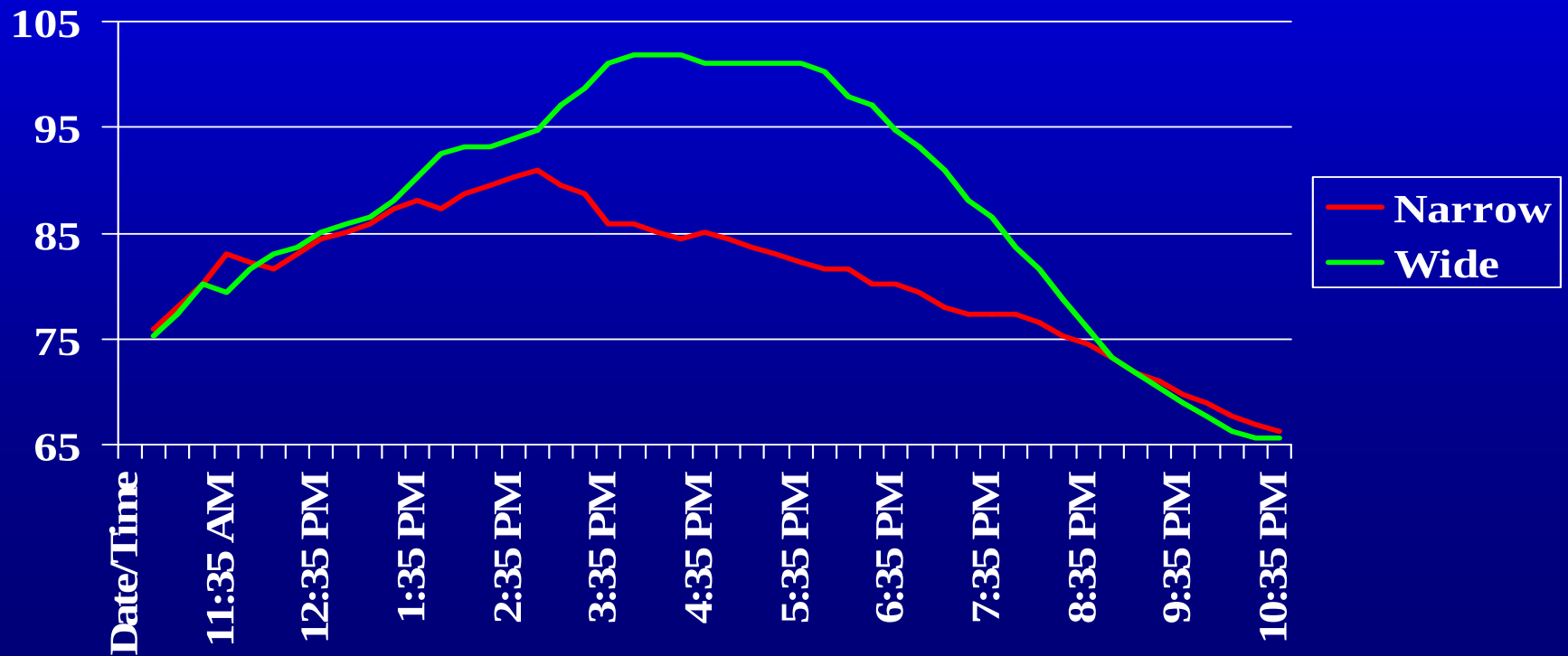

Swath
Sunlight
-0.4
-0.2
0
0.2
0.4
0.6
0.8

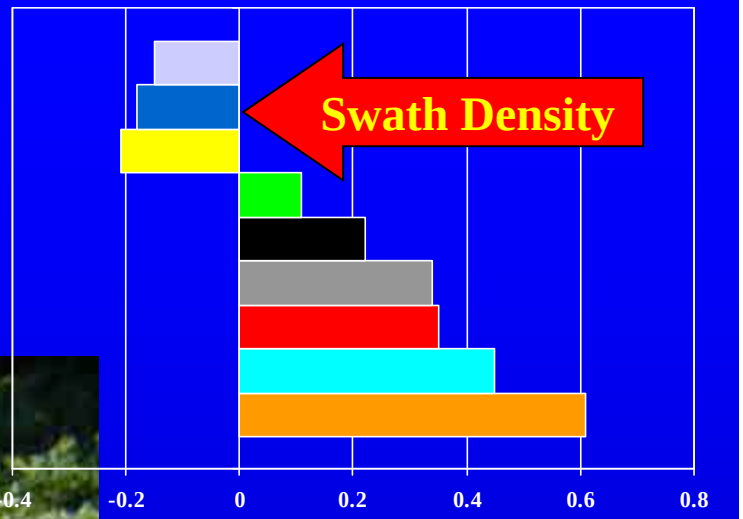

3 X more
sunlight

2nd Cut Grass Swath Core Temp

Swath Air & Swath Temp

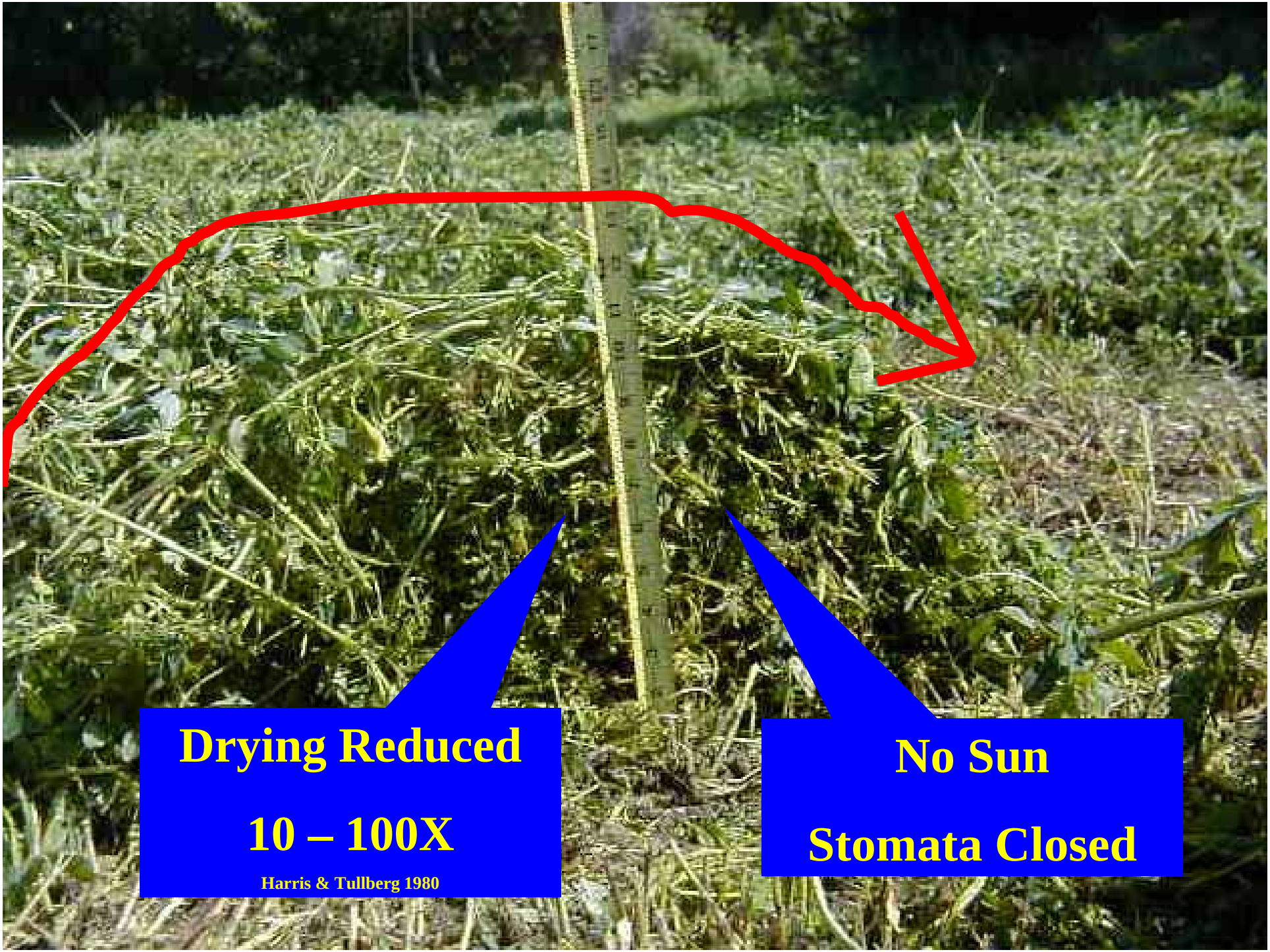




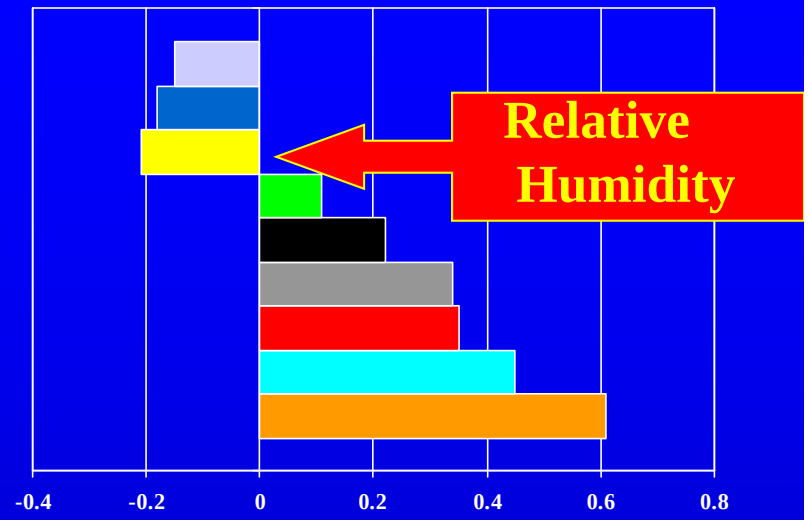


Density had greater impact on drying than Conditoning, Mixing or Turning Swath Wright et al. 1997

Swath density decreases moisture removal


Drying Reduced
10 – 100X
Harris & Tullberg 1980
No Sun
Stomata Closed

Swath Core Relative Humidity

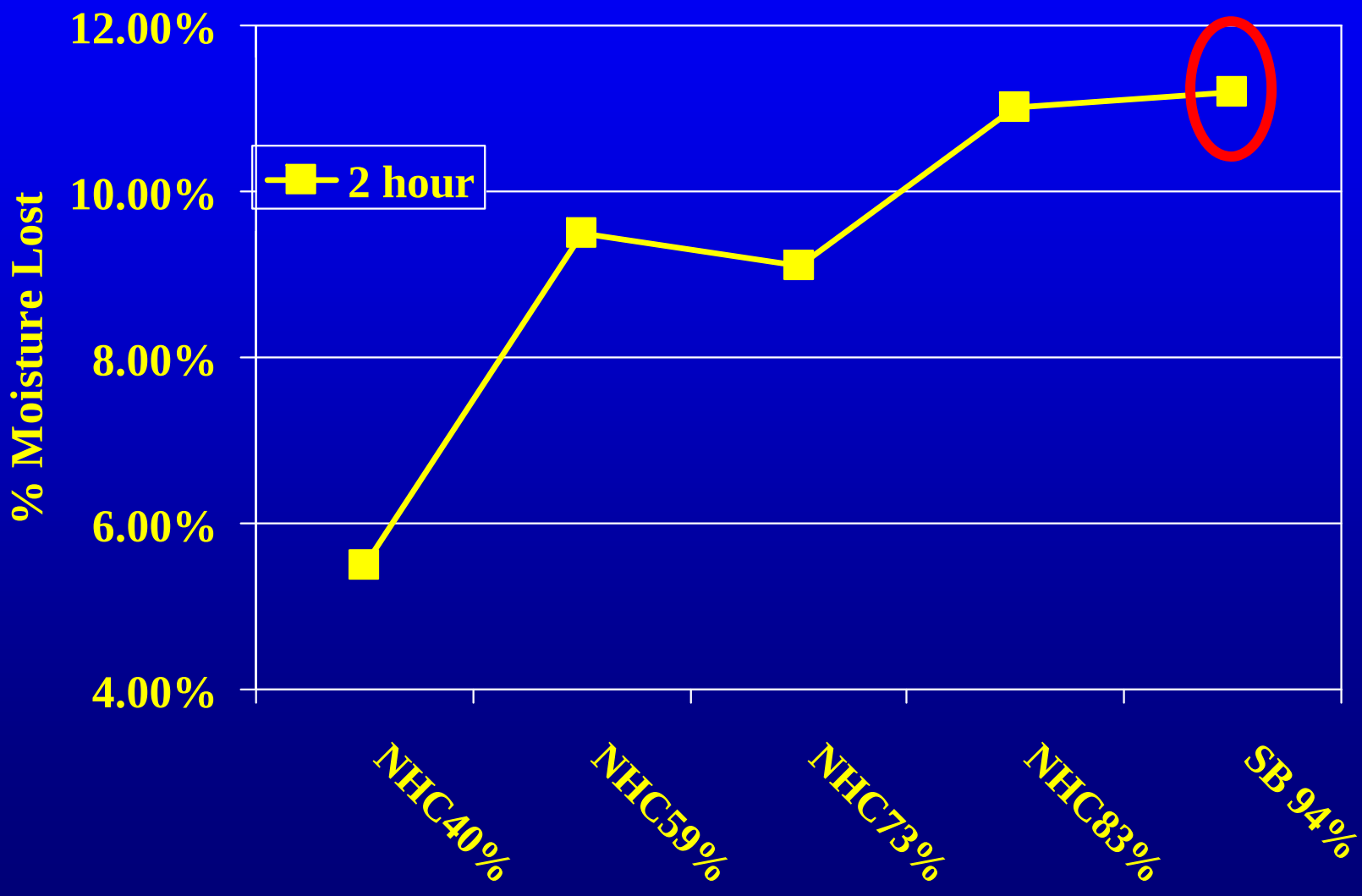


Wide swath

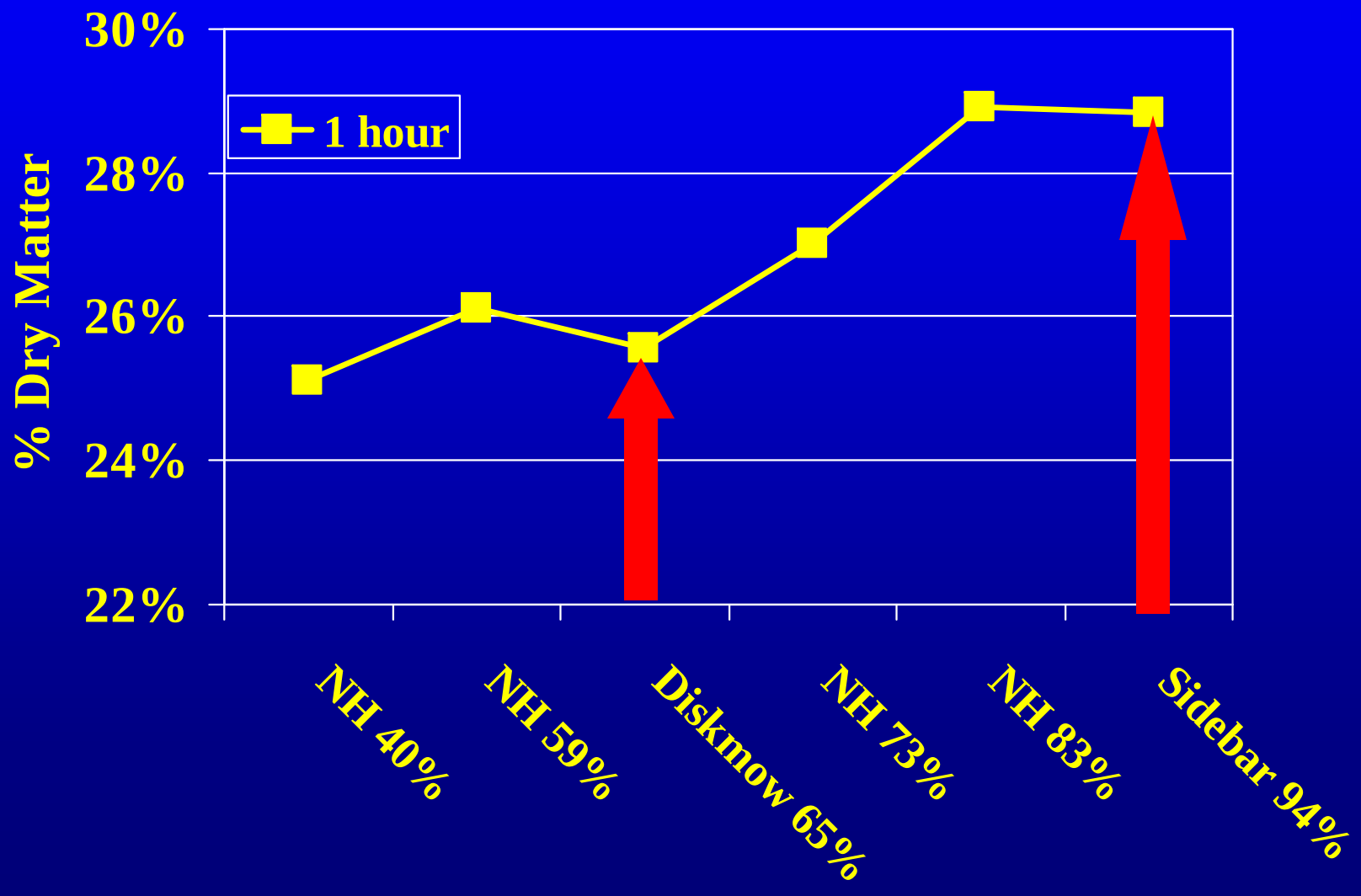
Field Results?

12 ft mower opened to wide swath = 8 ft.
66% of cutterbar width

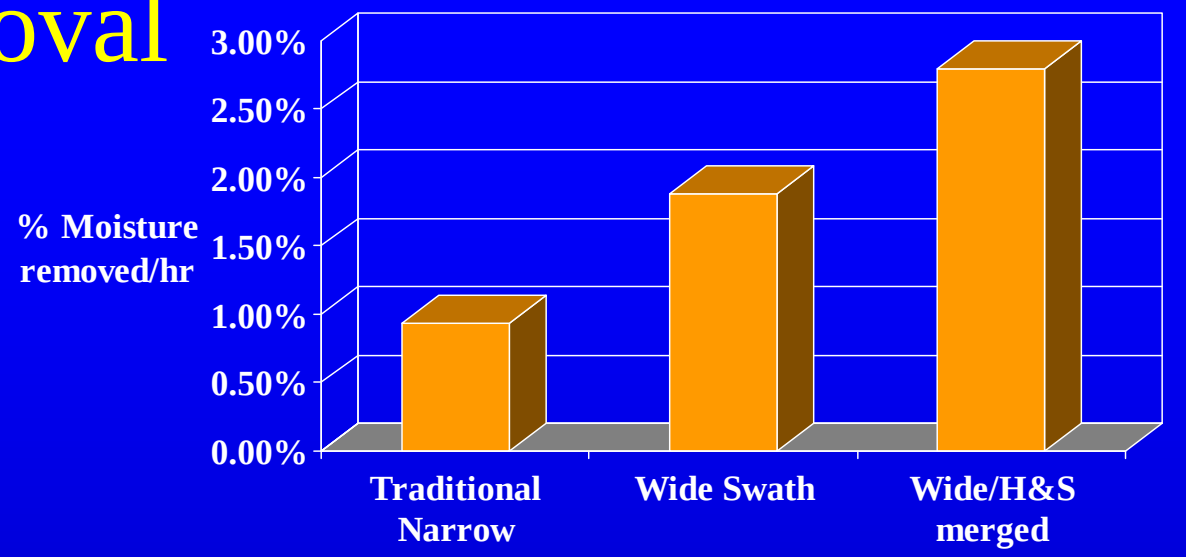
Width Matters More Than Conditioning – Alfalfa- Swath Not Moved



Width Matters More than Conditioning – Grass – Swath Not Moved



Moisture Removal Rate/Hour

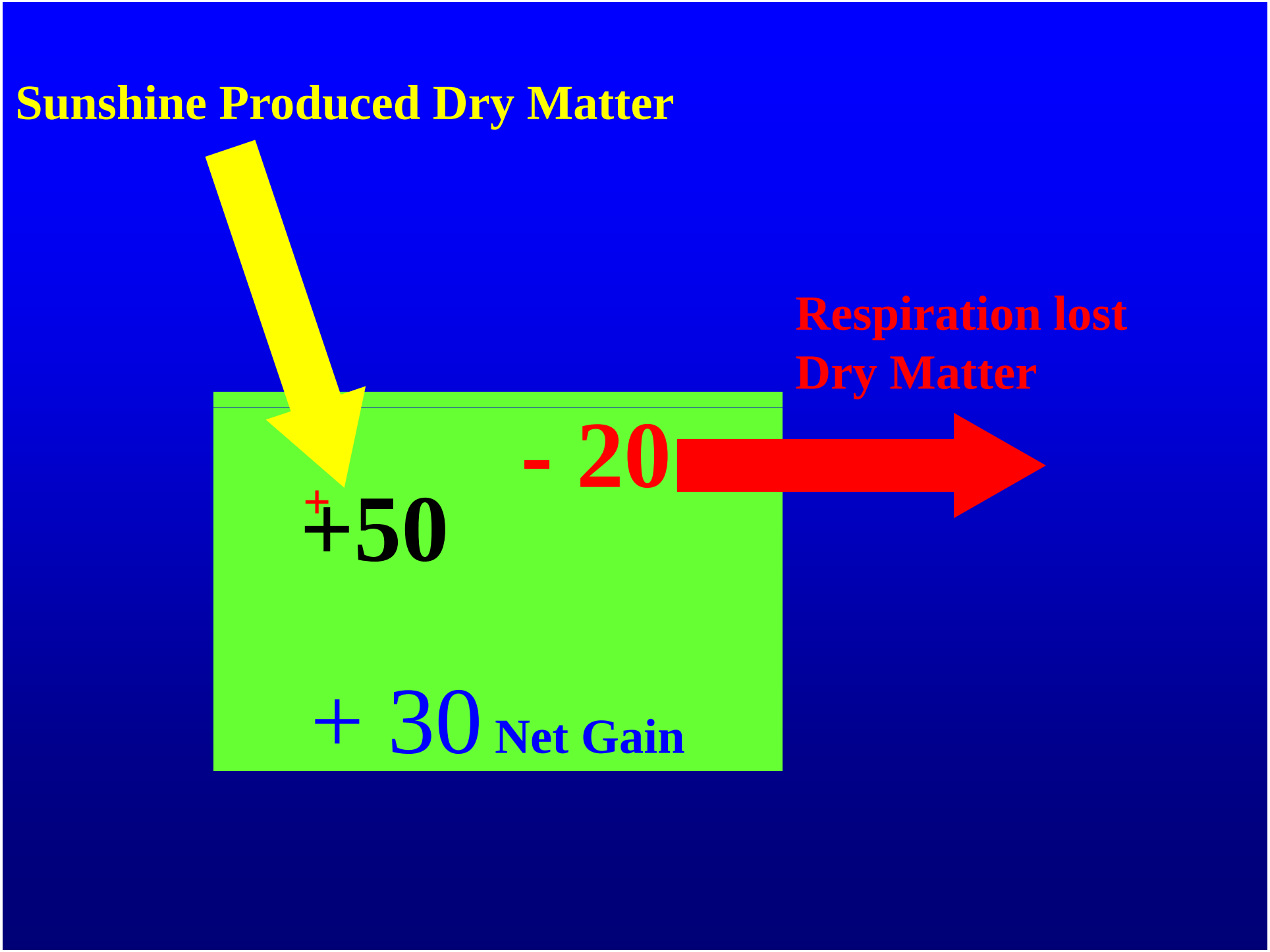


1st Cut Harvest Window

16 **May**	17	18	***19***	***20***	21	***22***
23	24	***25***	26	27	28	***29***
30	31	1 **June**	2	3	4	5
6	7	8	9	10	11	12

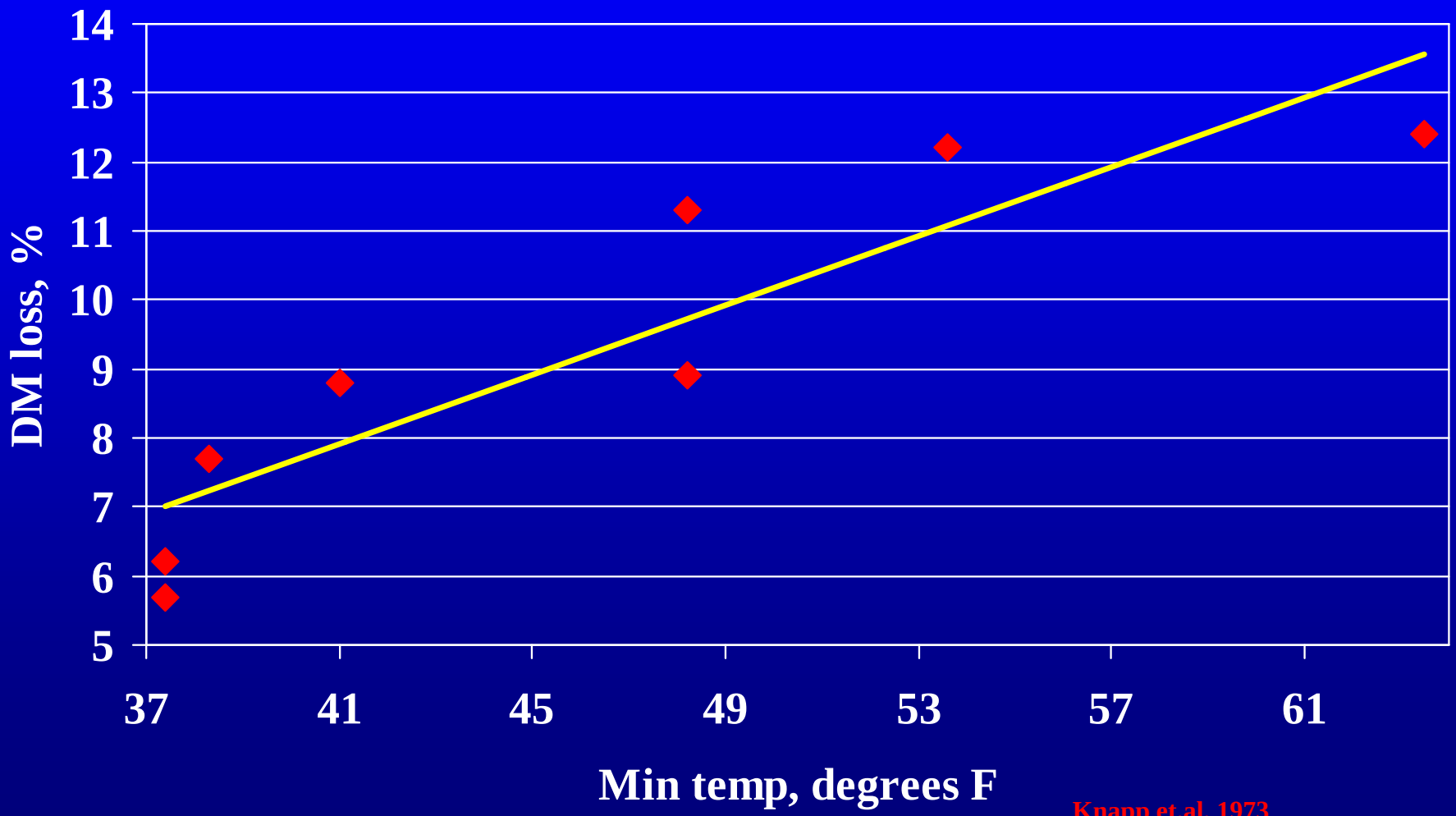
What Quality Reaches the Cow's Mouth

- Wide Swath Makes a Difference!!


Sunshine Produced Dry Matter
Respiration lost
Dry Matter
- 20
+50
+ 30 Net Gain

Sunshine Produced Dry Matter

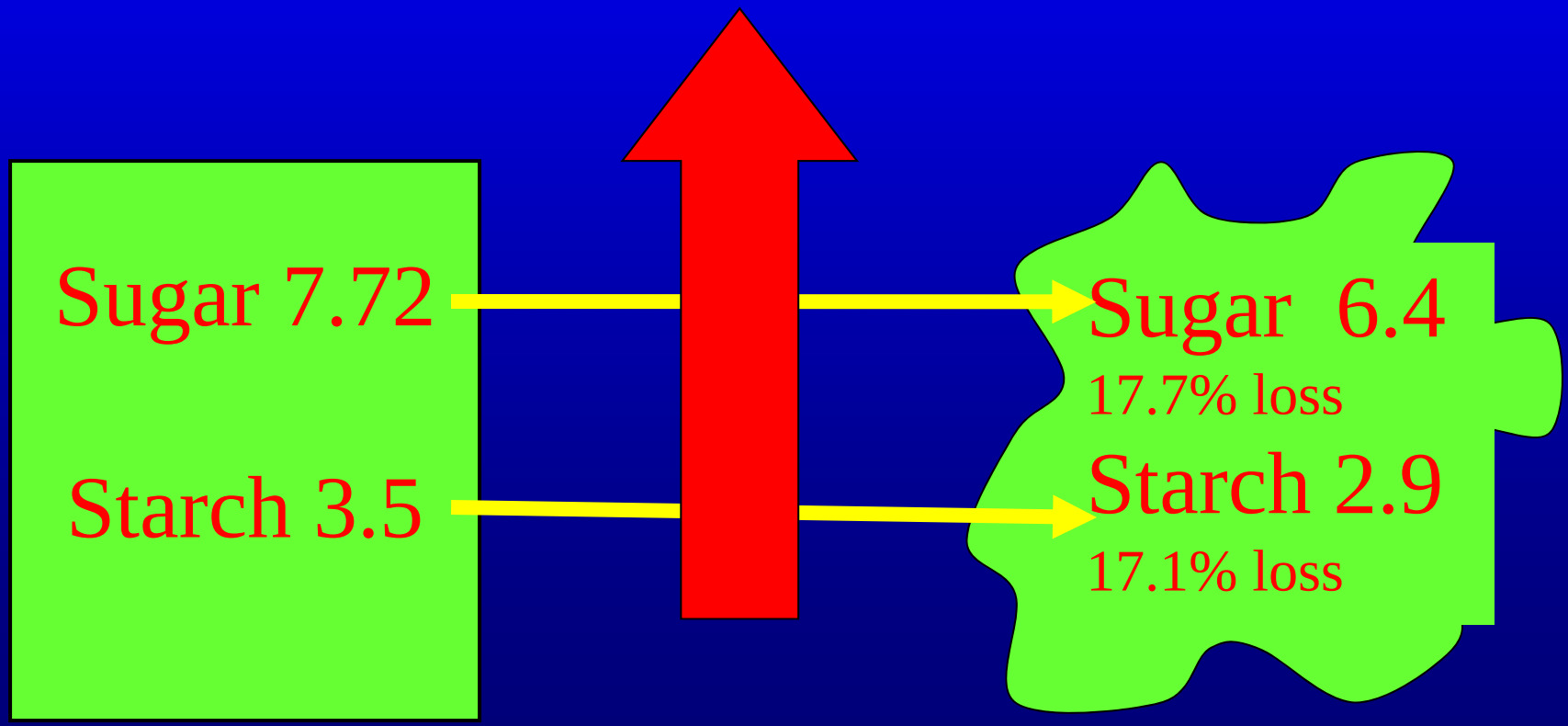
Relationship between overnight DM loss and minimum night temps



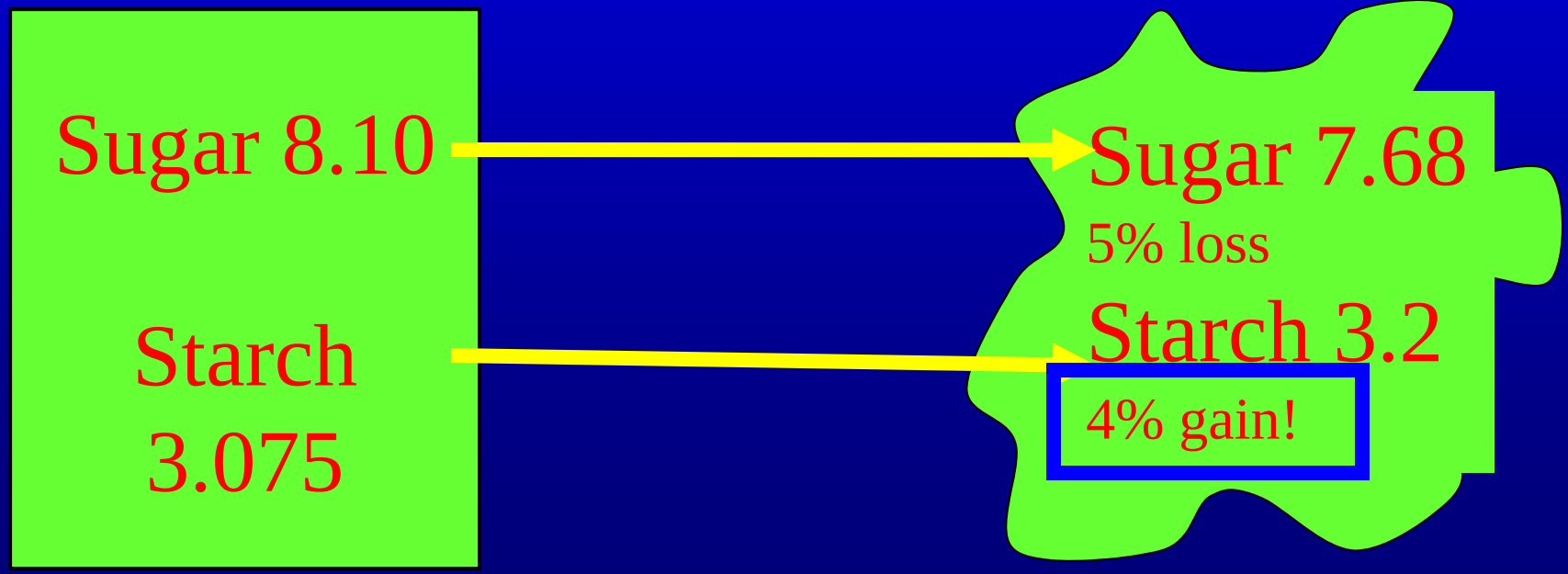
Knapp et.al. 1973

Milk loss From Respiration in just 24 hours

16% - 30% of Dry Matter loss by Respiration



Wide swath




Narrow Fresh
Wide Fresh
Narrow Wilt
Wide Wilt
0.65
Nel 0.55
0.45
1st cut alfalfa
2nd cut grass
2nd cut alfalfa

Impact of Drying Time on Forage NPN

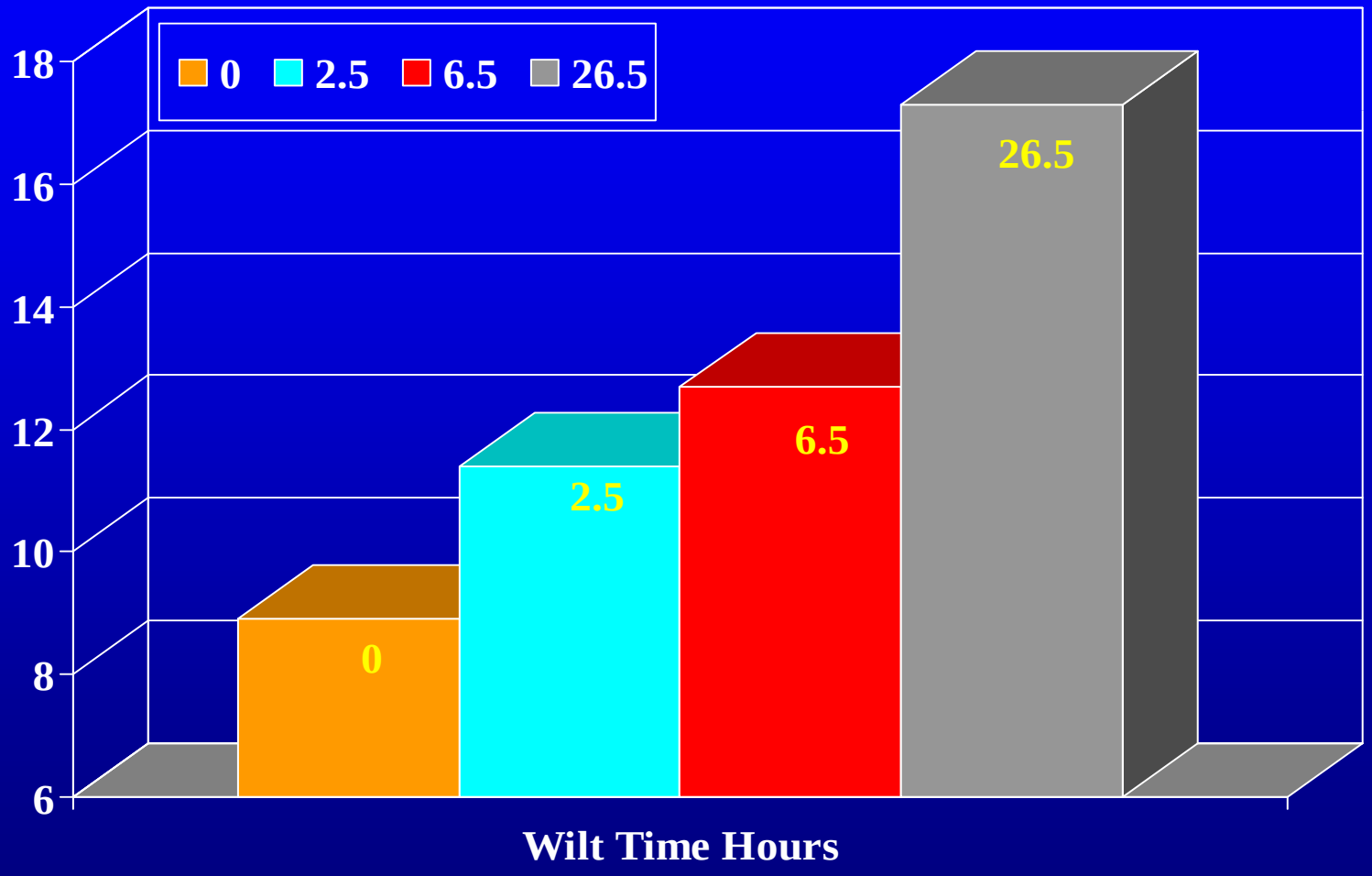


Table from Brady, 1960

Impact on Potential Milk/Ton

	1st Cut Alfalfa	2nd Cut Grass
Narrow Fresh	**2652 a**	**3513 a**
Wide Fresh	**2731 a**	**3606 a**
Narrow Ferment	**2279 b**	**3400 b**
Wide Ferment	**2574 a**	**3705 a**
lbs potential Milk/ton	**294.9**	**304.5**
$/ton DM	**$44.24**	**$45.68**

275 Acres x 3 T DM/A x $40/T = $33,000

Wide Swath

- **Mowers are limiting factor: 50:9ft 200: 36**
- **Width matters most for hay silage or dry hay**
- **Conditioning works for dry hay, counter productive for silage**
- **You can get same-day hay silage**

Wide Swath Has Huge Impact on Harvest System

- Chopper and Trucks ready when you start mowing
- Chopper running closer to capacity – greater field efficiency
- May need more trucks/wagons
- Bunk set up (Packing & Leveling) for more rapid fill
- Might have to switch from progressive wedge to flat fill
- Check particle size (non uniform feed to cutters)

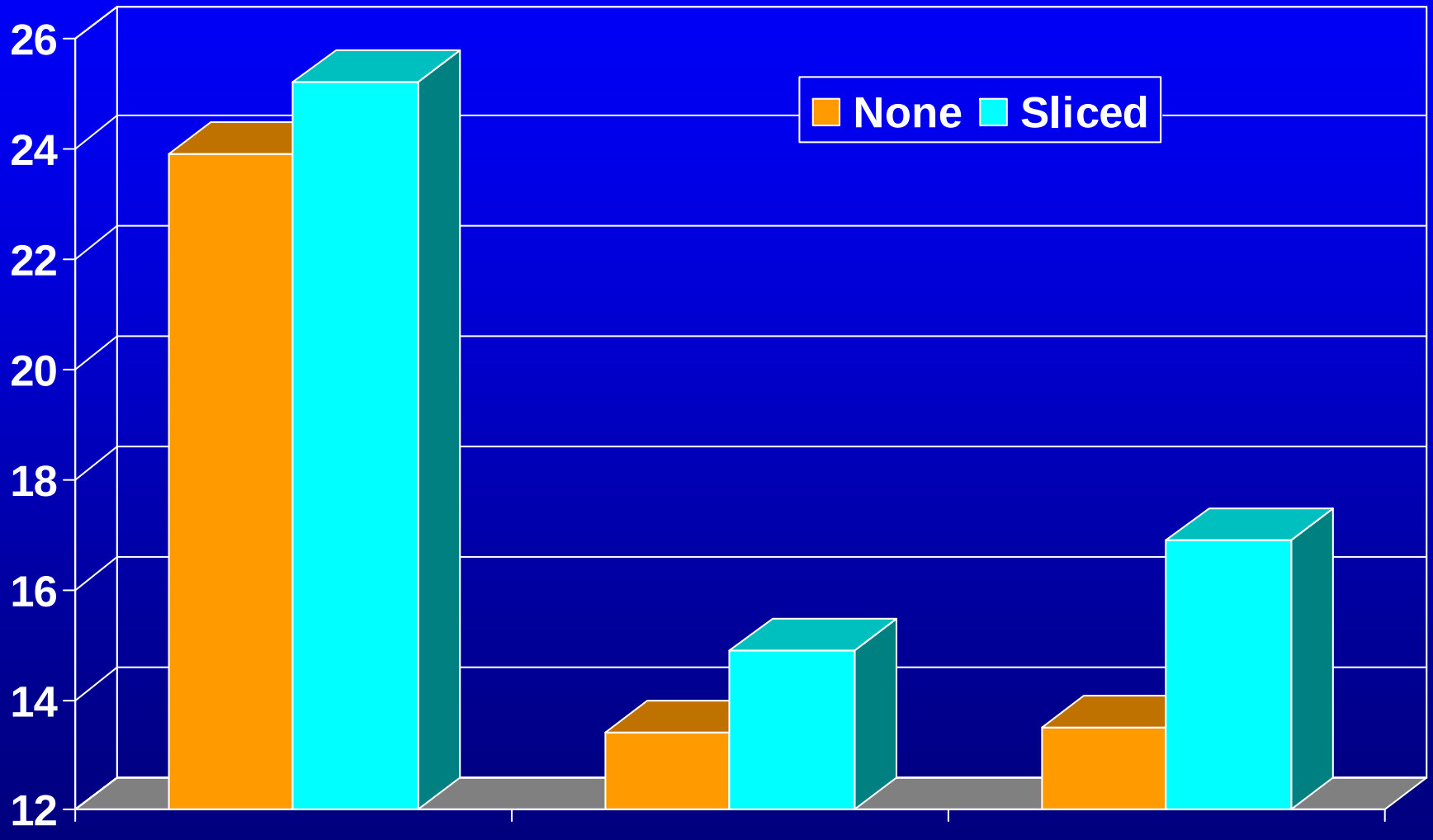
Haylage

Only REAL Measurement of Effective Fiber!

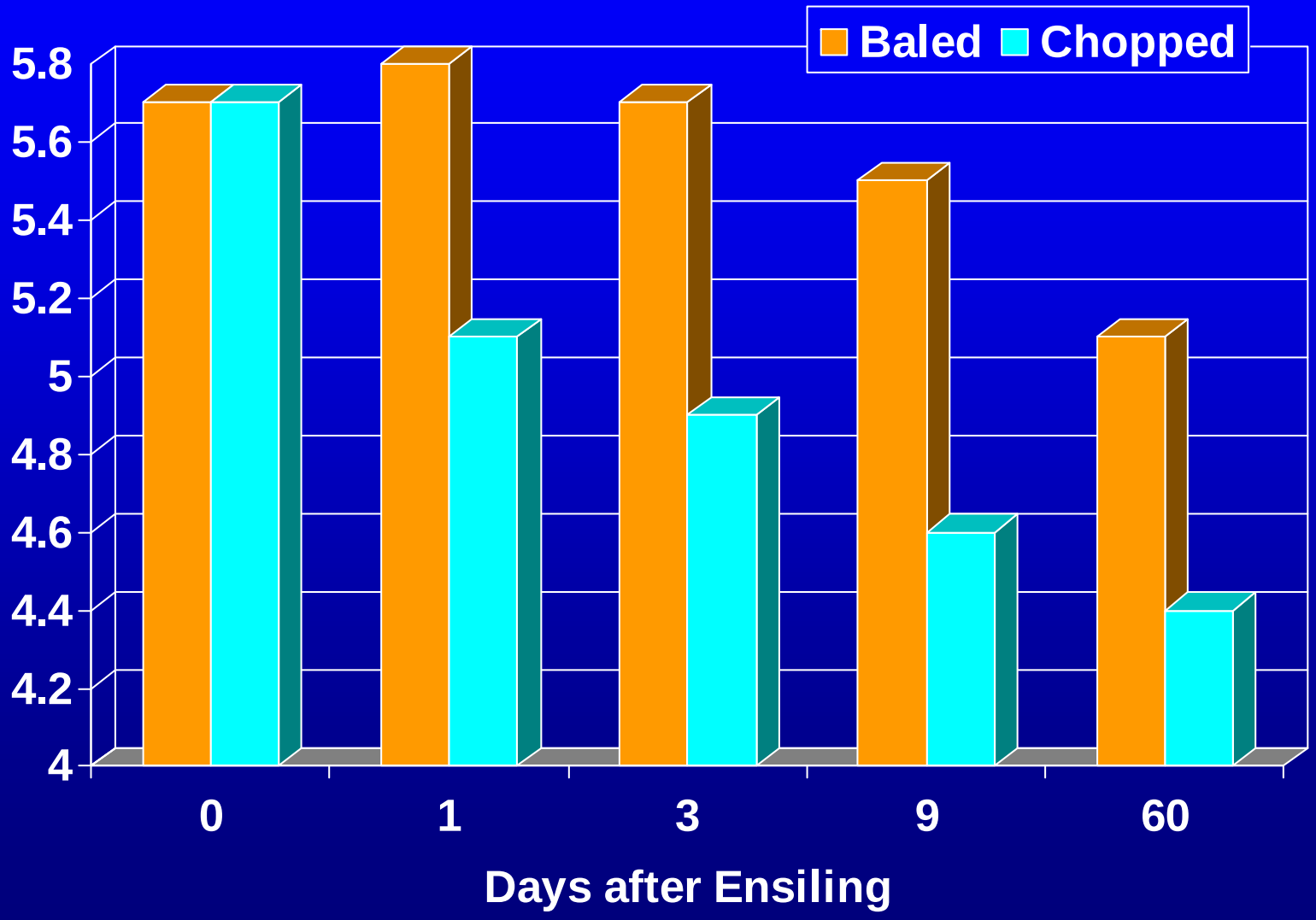
	Sealed Silo	Bunk Silo
Top	10 - 15 %	15 - 25%
Middle	30 - 40%	
Bottom	40 – 50%	

Note: Post Fermentation Screening makes particles stick together and appear on a larger screen than they actually are.

Impact on Dry Matter Intake
No Processing vs Sliced When Baled

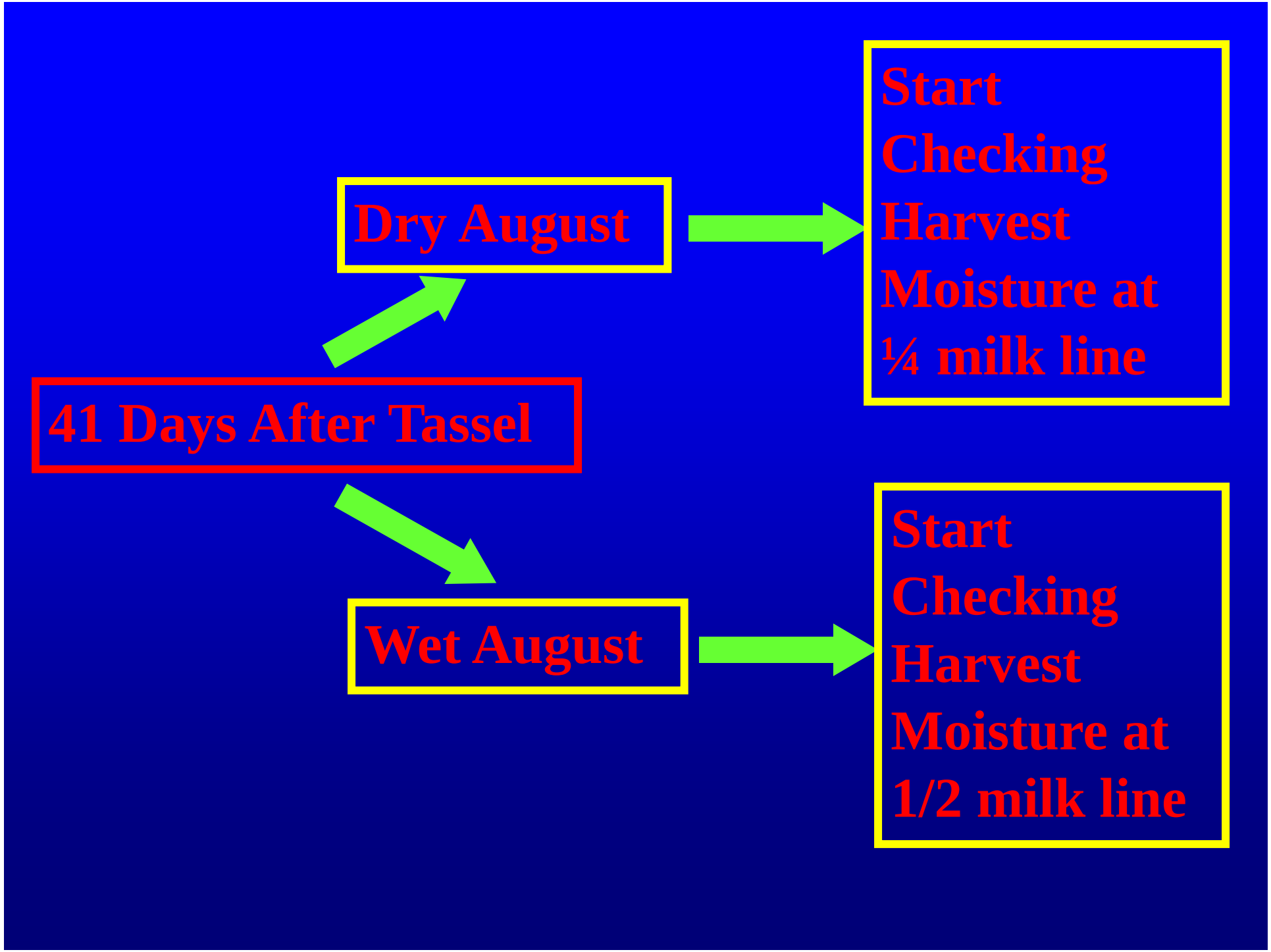


Baled vs Chopped, Impact 0n pH



Corn Silage Harvest

Making the Most of What you Grow


Start Checking Harvest Moisture at ¼ milk line
Dry August
41 Days After Tassel
Wet August
Start Checking Harvest Moisture at 1/2 milk line


The only accurate predictor of silage harvest is a DRY MATTER CHECK

Corn Silage

	Sealed Silo	Bunk Silo
Top	2 - 4 %	10 – 15%
Middle	40 – 50%	
Bottom	40 – 50%	

Only REAL Measurement of Effective Fiber!

Note: Post Fermentation Screening makes particles stick together and appear on a larger screen than they actually are.

WHAT IS CHEAPER? A SILO FULL OF SILAGE TOO FINE/CORASE OR A $250 FORAGE SCREEN SET?

Silage processing

- Generally agreed that processing at ¾” TLC and 1-3 mm increases starch availability and milk production.
- Roller clearance depends on silage maturity:

  “Start with a nickle, end with a dime.”
- Watch custom harvesters closely! Check kernels and cobs. Cobs should be “kibble” size, 95% of kernels crushed.
- Machine capacity is reduced by 25% or so, and power requirements increase by about 10%.

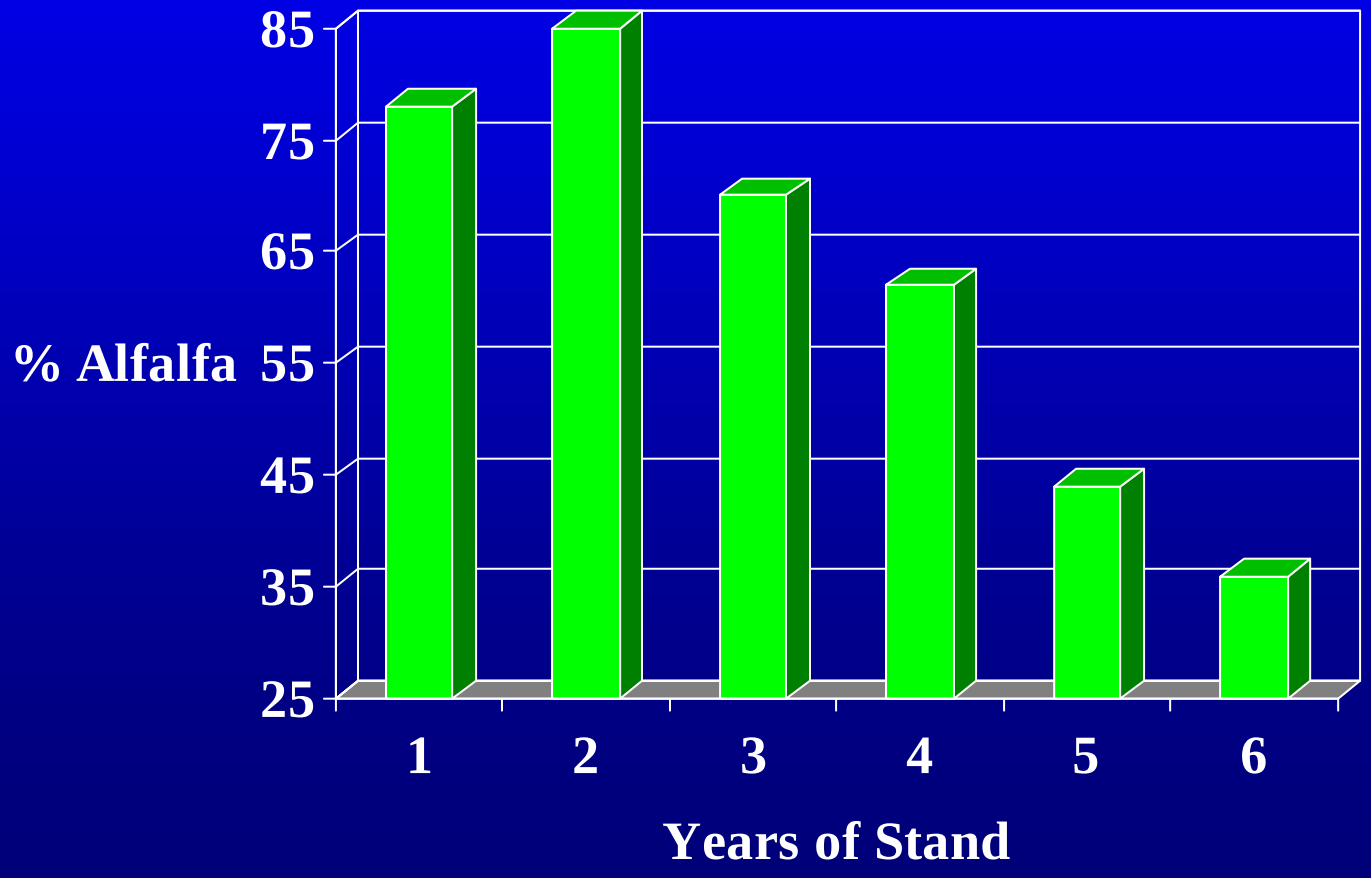
Processed or Not: Are the Kernels Clipped?

- $3 plastic dish pan or a pail
- Fill with water
- Dump in silage
- Swish around
- Pour off water with floating silage
- Kernels are left at the bottom
- Check for chipping vs whole kernels.

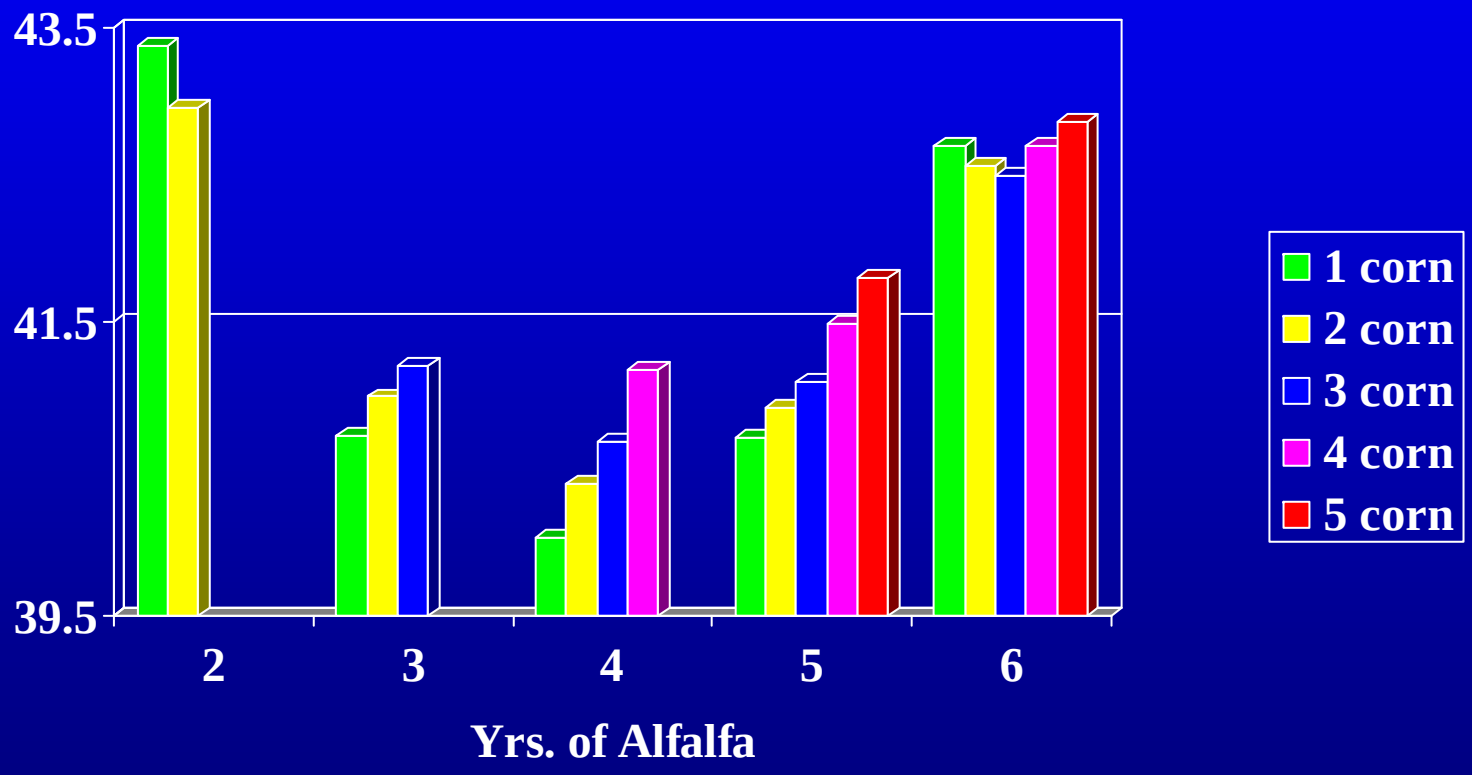
Whole Farm Impact

http://counties.cce.cornell.edu/agriculture/rensselaer/

Composition of Crop Harvested over Length of Stand



How Your Rotation Choice Affects Cost/ton DM



Crop Plan Summary

Crop	2003	2004	2005	2006	2007
Total Corn	277	236	258	**270**	218
Corn Grain	0	0	0	**0**	0
Corn Silage	277	236	258	**270**	218
Total Hay Crop	682	664	629	**542**	616
Mixed Hay	656	642	535	**526**	564
Grass Hay	26	22	94	**15**	52
New Seedings*	238	74	257	**128**	127
Idle/Other	43	103	115	**191**	169
Totals	1002	1002	1002	**1002**	1002

* Note: Acres of New Seedings are also included in the Hay acreages

1002

-191

809 cropped

- 15 cont. grass

794 rotated

Divide by 6 =

132 A seed

X 2 = 264 A corn

X 3 = 397 rot hay

Manure can BUILD rather than MINE nutrients

While saving on the fertilizer bill

Field ID	Acres	Crop	Total N Required	Total P2O5 Required	Total K2O Required	Primary Rate	N Balance (lbs/acre)	P2O5 Balance (lbs/acre)	K2O Balance (lbs/acre)
T2323-22	9.9	COS2	67	60	60	9,000	22	15	98
T2323-25	8.9	COS2	67	45	60	9,000	22	30	98
T2323-26	5	COS2	67	60	60	12,000	51	40	150
T2323-27	24.2	COS2	67	60	60	0	-67	-60	-60